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# Hydrogen Leak Detector
# Sensistor ISH2000 HySpeed

## Operating Instructions

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# Welcome to Sensistor ISH2000 HySpeed

Dear customer,

This manual provides user information for installing and operating the Sensistor ISH2000 HySpeed unit. For start-up installation advice please contact the supplier.

The Sensistor ISH2000 HySpeed is a development of the ISH2000 range of hydrogen leak detectors adapted for rapid automated leak detection in packaging lines. The leak detection process is built on the Sensistor technology that uses diluted hydrogen as tracer gas. The tracer gas is a safe and inexpensive standard mix of 5% hydrogen (E949) and 95% nitrogen (E941). These gases are commonly used as packaging gases, for example, and have been approved as food additives.

The Sensistor ISH2000 HySpeed comprises a compact, panel-mounted instrument and a wired sampling probe. For a complete test station, it is normally necessary to install equipment for handling the packages and for communication with the leak detection instrument.

In principle, in-line leak testing with the Sensistor ISH2000 HySpeed suits all types of packaging where it is possible to create over-pressure for the enclosed tracer gas so as to permit leak testing. All types of flexible plastic packaging, such as bottles, bags for powders and creams, bag-in-box bags, trays and tubes can be tested.

When reading this manual, please pay particular attention to Warning, Caution and Notice found throughout the text. The Warning, Caution and Notices are defined in chapter 1.1.

This product complies with the requirements of European Directives, listed in the Declaration of Conformity found on page 49 in this document. These Directives are amended by Directive 93/68/E.E.C (E.C. Marking).

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# 1 User information

Read this user manual carefully before using the Sensistor ISH2000 HySpeed.

## 1.1 Notes and safety notices

This manual contains warnings and cautions concerning the safe use of the product. See definitions below.

**WARNING!**

**Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.**

**CAUTION!**

**Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.**

**NOTICE!**

Notice indicates instructions that must be followed to avoid damage to the Sensistor ISH2000 HySpeed or other equipment.

**Note: A Note is used to indicate information that is important for trouble-free and optimal use of the Sensistor ISH2000 HySpeed.**

## 1.2 Document outline

The document is devided in two main parts:

- Getting started
- Reference section

The Getting started part consists of step by step case examples, explaining how to use the Sensistor ISH2000 HySpeed in a variety common situations. The Reference section consists of in depth explanation and additional information, which completes the user manual with all relevant information.

## 1.3 Conventions used in this book

In this user manual the following text style (hardware command) is used for references to hardware commands or button labels, while this text style (*software command*) is used for references to software commands and menu choices.

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# 2 Description of equipment

## 2.1 Sensistor ISH2000 HySpeed

Sensistor ISH2000 HySpeed is a leak test detector optimized for high speed leak testing. The model is particularly aimed at testing packages, but possible to use for other applications as well where the time allowed for a LEAK/NO LEAK decision is extremely limited. The testing speed can be up to four tests per second. The detector is designed for integrating in a packaging machine or similar applications. If you intend to make the leak test using accumulation, shell damps, scanning or by hand sniffing we recommend the standard model of Sensistor ISH2000.

Sensistor ISH2000 HySpeed is equipped with a number of powerful functions making it very easy to integrate in a semi or fully automatic test system. The functions range from output of all necessary status signals and printer/ communication port to an advanced Active Probe Control system (APC). This makes the detector capable of controlling advanced sample collecting devices down to simple test fixtures.

The model consists of one part apart from the manual, etc:

Fig 2-1. Sensistor ISH2000 HySpeed

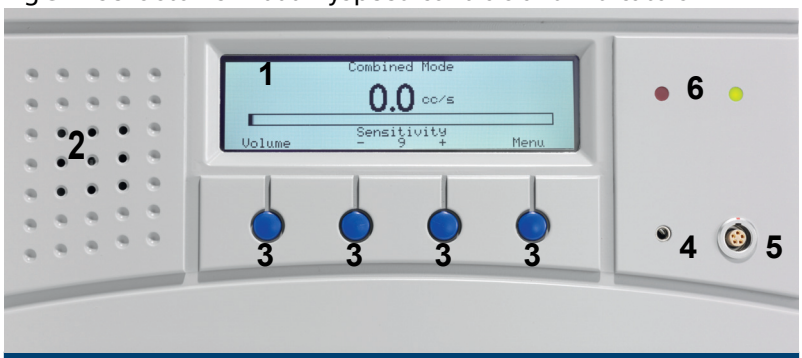
| Item | Description |
|---|---|
| 1 | Detector unit |
| 7 | User manual (not shown) |
| 8 | Product return form (not shown) |

# 3 Controls and connections



The controls and connections are discussed and shown in this chapter.

Fig 3-1. Sensistor ISH2000 HySpeed controls and indicators.




| Item | Description |
|---|---|
| 1 | Display |
| 2 | Loudspeaker |
| 3 | Control push-buttons |
| 4 | Earphone socket |
| 5 | Probe connector |
| 6 | LEDs |

## 3.1 Display

The display shows:

- indicator bar in Detection Mode and the figures in Analysis Mode.
- seven main menus. Their positions are indicated on a horizontal scale. Change from one menu to another using the < and > buttons.
- main menus have submenus, which are also indicated by horizontal scales and can be selected using the < and > buttons.
- scales for setting numeric values, languages, etc.
- messages.

## 3.2 Push-buttons

The functions of the push-buttons are shown at the lower edge of the display. In this manual the buttons are numbered, from left to right, 1, 2, 3, and 4. The push-buttons are used to:

- Change from one menu item to another using the < and > buttons.
- Press Enter to move down to the nearest submenu.
- Press Save to save the set value.
- Press Undo to restore the previously set value.
- Press Esc to move up to the nearest higher level(s).

## 3.3 LEDs

The two LEDs indicate the status of the instrument as follows:

- Green flashing slowly, during warming up phase.
- Green fixed light indicates that instrument is ready and hydrogen signal is below

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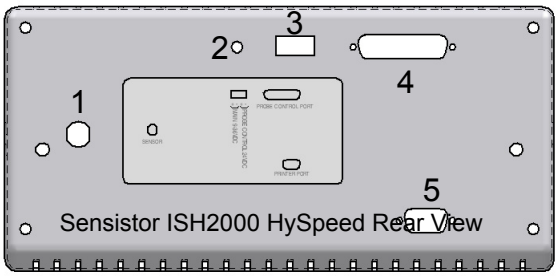
Reject Level limit.

- Red fixed light together with *Reject* on display means the instrument has detected a leak larger than the set Reject Level limit.
- Red flashing rapidly, check message on screen. (See “Trouble-shooting” on page 42.)

## 3.4 Ports and connections

### Sensistor ISH2000 HySpeed

Fig 3-2. Sensistor ISH2000 HySpeed ports and connections.




| Item | Description |
|---|---|
| 1 | Probe connection |
| 2 | Ground screw |
| 3 | Power connector |
| 4 | Probe control port |
| 5 | Printer port |

**NOTICE!**

Always connect all four wires to the Power connector to 24VDC in order to operate.

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# 4 Precautions

Read this user manual carefully before using the instrument. Hydrogen Leak Detector Sensistor ISH2000 HySpeed is extremely selective. Only Hydrogen Sulphide (extremely toxic) gives a comparable response to hydrogen.

## 4.1 When working with gas

The normal risks associated with working with all compressed gases must be considered.

**WARNING!**

**Pure hydrogen is a flammable gas. Only use ready-made Hydrogen Tracer Gas of 5% Hydrogen in Nitrogen. This is a standard industrial gas mixture used in various industrial applications.**

**Note:** Whenever the word Hydrogen is used in this manual it implies that the hydrogen gas is safely mixed with Nitrogen in the proportions 5% $H_2$ - 95% $N_2$.

**WARNING!**

**Since the tracer gas mix contains no oxygen, releasing large amounts of gas in a confined space may lead to asphyxiation.**

**WARNING!**

**Compressed gases contain a great deal of stored energy. Always carefully secure gas bottles before connecting pressure regulator. Never transport gas bottle with the pressure regulator fitted.**

Before connecting tracer gas: confirm that the connectors or test object is designed for working at the test pressure.

**WARNING!**

**Pressurising objects at too high pressures can result in a burst object. This in turn can result in serious injury or even death.**

**Never pressurise objects that have not previously been burst tested or otherwise approved for the chosen test pressure.**

**Note:** INFICON AB can not take any responsibility for the consequences arising from the inappropriate use of certain test pressures.

Pressure shocks might cause strong sounds which can cause impairment of hearing.

Check that all relevant legislation and safety standards are complied with before putting Sensistor ISH2000 HySpeed into service.

## 4.2 Hydrogen Tracer Gas for leak detection

When pure hydrogen gas is released in air its flammability range spans from 4% to 75% of hydrogen in air. Below 4% there is insufficient chemical energy available for a flame to occur. Above 75% hydrogen there is not enough oxygen left to support a flame.

When, for example, a mixture of less than 5.5 % hydrogen in nitrogen mixes with air there is not sufficient energy to support a flame, irrespective of the ratio of air-to-gas.

When a mixture of more than 5.5 % hydrogen in nitrogen is released into air there is a region of ratios of air-to-gas where the mixture is flammable. When, for example, a mixture of 10% hydrogen in nitrogen mixes with air there is still very little energy available. Only in exceptional circumstances can a flame be self-supporting. However, such mixtures cannot detonate.

**WARNING!**

**Hydrogen/nitrogen mixtures containing approximately more than 15% hydrogen can detonate when mixed in certain proportions with air.**

**NOTICE!**

**Never make your own mixtures. Only use ready-made mixtures or use a certified hydrogen/ nitrogen mixture mixer installed by your gas supplier.**

## 4.3 Interferences

Most tracer gas methods suffer from some sort of interference. Either the detector is sensitive to other gases or vapors, or there are other sources of the gas present to which the detector is sensitive.

Some examples of possible hydrogen sources:

- Engine exhaust
- Battery charging stations
- Cigarette smoke
- Breathing air
- Human flatulence
- Scratching on aluminum surfaces

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# 5 Working principle

## 5.1 Leak detection methods

Leak detection or leak testing can easily be done with help of Sensistor ISH2000 HySpeed.

By pressurizing the test object with a tracer gas, consist a mix of 5% hydrogen and 95% nitrogen, all hole and capillaries will be filled up with the tracer gas.

The tracer gas penetrates through leaks and out on the outside. On the outside the leaks position will be able to detect and the size of the leak be able to measure by the leak detector instrument with a tracer gas-sensitive probe.

## 5.2 Gas sensor Technology

The Sensistor ISH2000 HySpeed leak detector is using an extremely sensitive hydrogen gas sensor based on a microelectronic field effect transistor (MOS-FET).

The gas sensitivity appears when hydrogen absorbs into the sensor through a metal alloy (metal hydride) layer.

Only hydrogen can diffuse into the metal and this makes the sensors practically insensitive to other substances that do not contain free hydrogen molecules.

The signals from the sensors are processed by a microprocessor which also controls the sensor temperature with high accuracy, and other sensor diagnostics in order to ensure perfect functionality. It also automatically compensates for background gas.

## 5.3 Condition for leak detection

To use the leak detector the test object must be filled and pressurized by tracer gas (95% $N_2$/ 5% $H_2$) to get a gas flow through the leak. The tracer gas is a standard welding gas of industry quality, easy to obtain at low cost. The generic name is Forming Gas. Appropriate gas filling equipment can be obtained from the leak detector supplier.

Be careful of how tracer gases are handled after use. Released tracer gas contaminates the surrounding air with hydrogen and can complicate the following measurements for a time. Ensure that the tracer gas is ventilated away from the target area, preferably to the outside of the building.

## 5.4 Leak detection modes

The detector operates in three modes:

- The leak locating mode (Detection Mode), mainly used for detecting and locating leaks but not quantifying them.
- The hydrogen measurement mode (Analysis Mode) measures the concentration of hydrogen.
- The Combined Mode, (default mode) which is a combination of Detection and Analysis mode.

The Detection Mode operates continuously while the Analysis Mode determines the hydrogen concentration (and calculates a corresponding leak rate) in a step measurement. Detection Mode gives no numbers. It therefore needs no actual

calibration. The sensitivity of the sound signal and the moving bar on the display is set manually or automatically, see below.

When using the instrument in Analysis Mode, it must be calibrated as described. See “Calibrate the leak detector” on page 17 in order to give correct figures.

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# 6 Operating the detector

## 6.1 To Detect leaks

If all you wish to do is to detect the presence of a leak, that is, find out whether there is a leak or not, then use the **Detection Mode** (or use the detection bar in **Combined Mode**). The definition of Leak/No Leak will then simply be "A leak is a leak when it can be detected by the detector, set to a specific sensitivity".

To set up:

The operation in **Detection Mode** is not quantitative. The audio and visual signal will increase and decrease with the gas concentration. Therefore, there is no actual calibration to be done, but rather a setting of the sensitivity to a desired level.

A typical set-up procedure for **Detection Mode** is:

- Set up a reference leak which corresponds to the smallest leak you wish to detect.
- Put the probe close to the reference leak and note approximately what reaction you get (no reaction, small, medium, high, full scale) within the first few seconds.
- Set the sensitivity. This can be done permanently under the menu **Detection Mode Settings** or temporarily as a **Direct Sensitivity Adjustment** on the display (unless you have set this function to OFF under the Detection Mode Settings menu).

There is also an Auto ranging function which can be selected under the Detection Mode Settings menu.

**Note:** If the **Detection Mode** is used and the alarm function is required to be activated at a particular calibrated level, then the unit must be calibrated in accordance with the instructions, see "Calibrate the leak detector" on page 17. The reason for this is that the alarm is based on the **Analysis Mode** when the **Detection Mode** is displayed.

## 6.2 To Locate Leaks

**Note:** The **Detection Mode** (or use the detection bar in **Combined Mode**) is used to locate leaks. This mode is semi-quantitative, that is, it gives an audio and visual signal which increases as a leak is approached (a higher gas concentration) and decreases as you move the probe away from the leak. It does not display figures. In this mode of operation leaks can easily be detected using a sensitivity which can be preset. See "To locate leaks" on page 24 and "Direct Sensitivity Adjustment" on page 25.

Leaks can be located very accurately, even when there are other leaks nearby. If, for example, you are trying to locate a leak on a product and the product has a major leak, then you will get an audio signal as soon as the probe is placed close to the product. When the probe is moved around and over the product, the signal will increase as the probe approaches the leak. If the signal goes out of scale, simply reduce the sensitivity setting to bring the signal within the scale. Working with the sensitivity setting this way you will be able to locate multiple leaks that are in close proximity to each other.

**Note:** Working inside a confined space such as, for example, a cabinet or a narrow passage on a combustion engine there is a risk that the background concentration accumulates to levels close to the upper detection limit of the detector. In such case it will not be possible to locate leaks as easily as in open spaces.

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**Hint:** It is good practice to detect a leak, locate it, and immediately remove the probe to avoid saturation. The probe is not damaged by the exposure but it will recover more slowly. After excessive exposure it will be less sensitive for a short period of time.

## 6.3 To Quantify Leaks

The **Analysis Mode** (or use the analysis figures in **Combined Mode**) is used for measuring the size of a leak (or the concentration of a gas sample). To be able to do this measurement and obtain correct values, the instrument must first be calibrated using the calibration function.

In the **Analysis Mode** the detector determines the gas concentration from the change, as the probe goes from being exposed to background to being exposed to a certain gas concentration. The detector does not continuously monitor the gas concentration but takes just one reading instead. Another suitable alternative name for this mode could be Sampling Mode. It is important to keep this in mind when using the detector in this mode.

In **Analysis Mode** the probe should be moved directly from a background situation to the test point. The size of the leak in PPM, or any other selected units, is shown on the display. The probe can and should be removed from the measuring point as the measured value steadies and remains on the display. The period during which the measured value is displayed can be adjusted in the **Analysis Mode Settings** menu.

The leak detector operates in the range 20 - 50000 ppm (0,002-5%) H2.

**CAUTION!**

**• Do not open detector! Service of this equipment may only be carried out by service organisations authorised therefore by INFICON, Sweden.**

**• If the detector gets outer damage it must be controlled and repaired by service organisation authorised by INFICON.**

**• Do not expose the probe to a hydrogen concentration higher than 0.1 % when the instrument is not put into operation, this might damage or destroy the probe sensor.**

**Note:• When the instrument is put into operation the sensor withstands temporary exposure to hydrogen concentration up to 100%. Avoid long exposures to high concentrations.**

# 7 Calibrate the leak detector

## 7.1 Introduction

The leak detector is the instrument and the probe together.

This section of the user manual consists of step by step examples about how to calibrate the detector in the most common cases. For more about the calibration routine see the reference section.

The instrument must be calibrated by using the integrated calibration function to make sure it displays the correct values in Analysis Mode. After calibration the instrument will show the correct measured values on the display in *Analysis Mode*. The calibration parameters will be stored into the probe or in the Combox.

## 7.2 Calibration reference

There is a possibility to calibrate the detector by Reference Gas concentration.

A Reference contains a well-defined concentration of Hydrogen gas in ppm mixed by air or some inert gas. If you use premixed Reference gas a Certificate will normally follow the gas bottles. Reference Gas can be ordered from local gas suppliers.

Choose a calibration reference size, as follows recommendations:

- Same or higher than the Reject Level (but maximum 10 times higher)
- in the following range: 500-5000 ppm H2

Please contact the provider of the detector for help to select optimal calibration reference for your application.

## 7.3 Calibration procedure

Before calibration, the *Reference Value* in the *Calibration Menu* must be set. See “With reference gas concentration”.

When calibrating, expose the probe to the background air then do the following steps:

1. First Menu then Calibration/Calibrate/Enter.
2. Push the *Start* button or push the probe button.
3. Expose the probe to the reference gas/leak

The probe does not have to be exposed to the to the calibration gas during the whole *Calibration Time* (the time set in the *Calibration* menu while the bar is moving). The instrument only measures the change as the probe goes from the background air to calibration gas.

While the calibration time bar is moving, the probe should be exposed to the calibration gas or reference leak. Then the display shows *Detecting Gas* and gives sound signals. Repeat the calibration routine until you can save the calibration. If the calibration is not saved, the instrument will revert to the previous value after one minute.

**Note:** You will need to repeat the calibration 2-3 times to get *Calibration OK* after changing setup or probe.

- Allow at least 30 seconds between each calibration for best accuracy!
- If the message "*No Gas or Unstable Signal*" is displayed repeatedly - go back to Detection Mode and check functionality.
- If *Repeat Calibration* is displayed then this means that the measured value deviated more than 25% (can be changed between 1-100%) from the previous calibration. Repeat the calibration procedure.

Also set the Analysis Unit to the same as the Reference Value. If you want to use another unit you have to put a recalculation number into *Correlation Value* which describes the relationship between the different units.

## 7.4 Reference value by gas concentration

The concentration of the reference gas should be near to or slightly higher *Reject Level* the for best accuracy and always within the range of 20-50000 ppm

Set the *Reference Value* equal to the Hydrogen concentration in your reference gas. If premixed reference gas is used, the reference value be found on the certificate of analysis issued for the gas concentration. Also set the *Reference Unit* to the same unit as that used to express the leak rate of the reference leak.

Example: Reference gas concentration contains 100 PPM Hydrogen.

1- Set the *Reference Value* = 100

2- Set the *Reference Unit* = "PPM"

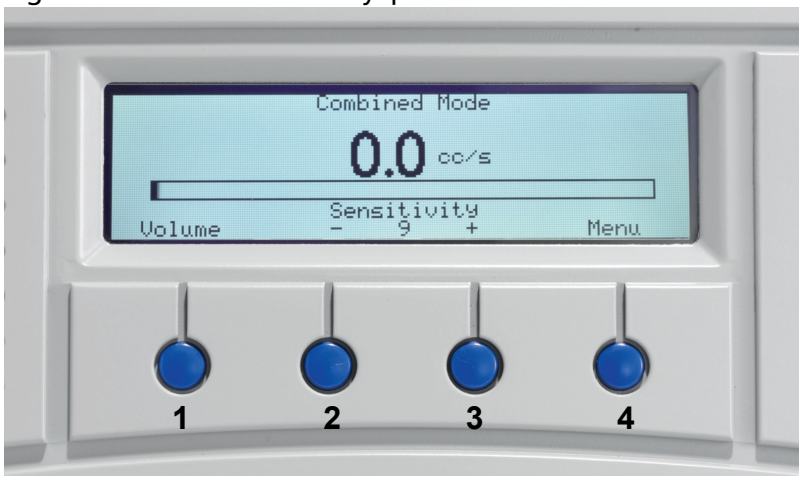
# 8 Reference section

This section of the user manual consists of an in-depth explanation and additional information, which completes the user manual with all relevant information.

## 8.1 Menu system

The menu system is designed as a tree structure similar to that used in mobile telephones. The display shows all the levels when browsing down through the menus so that you can always see exactly where you are.

Fig 8-1. Sensistor ISH2000 HySpeed controls and indicators.




To enter the menus, press Menu (button 4). Press < and > (button 2 and button 3) to choose between main menus.

If no setting is made in a menu or its submenus within 60 seconds, the instrument will revert to the Detection Mode/Analysis Mode.

### Button functions

The buttons may change functions in different menues. Always read the text, just above the buttons in the display, for the button functions.

All changes in values are valid only when saved using the Save button (button 4).

Use the Undo button (button 1) to delete a change in value and revert to the previous setting.

Use the Esc button (button 1) to browse backwards through the menus to the start position *Detection Mode/Analysis Mode*.

To change quickly from *Detection Mode* to *Analysis Mode* or vice versa, press button 4 three times in succession.

## 8.2 Engineering format

Some of the parameters of the detector are written in engineering format. This format can represent a very wide range of numbers from very small to very large numbers.

The following examples describes the format used in the detector:

1.00E+01 = 1.00 x $10^{1}$ = 10

$1.00E+00 = 1.00 \times 10^{0} = 1$

$1.25E-02 = 1.25 \times 10^{-2} = 0.0125$

## 8.3 Change Test Mode

Choose the measuring method you will use in the menu Change Test Mode. There are three different methods to choose:

- Analysis Mode
- Detection Mode
- Combined Mode

See Reference section for a description of the functions.

## 8.4 Calibration

### Calibrate

The instrument must be calibrated by using the integral calibration function to ensure it displays the correct values in *Analysis Mode/Combined Mode*. After calibration the instrument will show the correct measured values on the display. The calibration parameters will be stored into the probe or the Combox.

### Calibration intervals

Calibration is a natural part of leak measurement and an important factor in quality assurance. It is impossible to specify an exact requirement for the interval between the calibrations because the applications for which the instrument is used can vary considerably.

There will be some oxidation of the probe sensor, which reduces the sensitivity, if the probe sensor:

- is not subjected to gas for a lengthy period or
- is exposed to a very small gas concentration (less than 10 PPM) with long intervals between exposure.

If the instrument is subjected to a very large gas concentration over a long period, a certain amount of insensitivity can occur directly afterwards. This saturation can make it difficult to detect very small leaks. Therefore, make it a habit of removing the probe from the measuring point as soon as the measured value is displayed. This gives the detector an opportunity to recover.

### Sensitivity too low for reject level

The Detector will warn if sensitivity of sensor is too low to safely detect a leak equal to the set Reject Level limit. The warning can be ignored and calibration updated and the CAL_CONF output will be set.

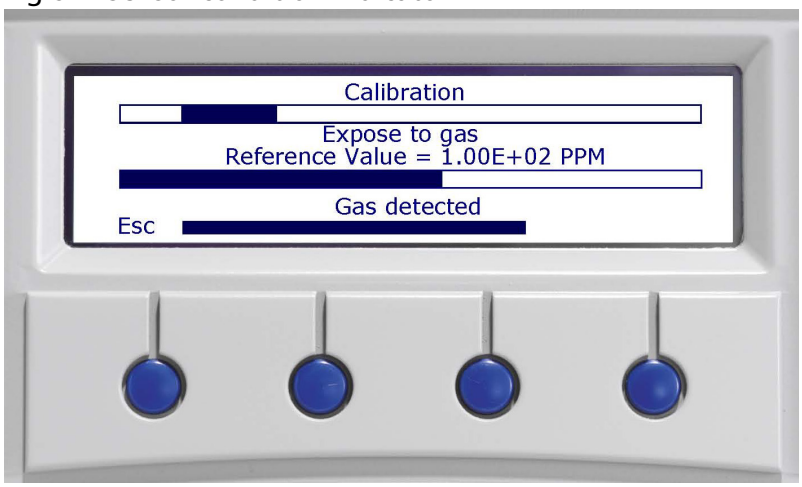
### High signal! Check reference!

The Detector will warn if the calibration signal is very high. The warning can be ignored and the calibration updated and the CAL_CONF output will be set.

## Sensor condition indicator

The indicator bar extends in length when the sensor is detecting reference gas. This indicator can be used for an early warning as to when a sensor replacement will be needed.

Fig 8-2. Sensor condition indicator.




The length of the bar shows the condition of the sensor. The bar will become shorter if the sensor has lost some in sensitivity. The scaling of the indicator is not precise enough to say at exactly what length the sensor must be replaced. You will learn when this happens for your particular application. The instrument will also tell you in clear text when sensitivity is too low. See further in the next section below.

## Calibration messages

Table 8-1. Different messages that can be displayed during calibration.

| Message | Explanation | Remedy |
|---|---|---|
| Expose to background... | Prepare the probe for calibration by holding it in hydrogen free background. | - |
| Detecting gas | Gas signal is detected. | Normal operation, gas exposure can be interrupted. |
| Repeat calibration | Calibration was not within 25% of last. Adjustable by setting Calibration Tolerance. | Wait 30 s and calibrate again. |
| Calibration OK | Calibration was within acceptable limit. | Press Save (button 4) to store calibration in memory. |
| No gas or unstable signal. | No gas signal or no stable signal detected during calibration. | Check reference. Gas valve may be shut. Check that probe tip is not clogged. |
| | Signal when reference gas is shut off. Happens for reference gas only. | Background is higher than reference gas concentration. Improve ventilation. |

| Message | Explanation | Remedy |
|---|---|---|
| Sensitivity too low for Reject level | Sensitivity of sensor is too low to guarantee correct response to a gas flow or concentration equal to the Reject level. The most likely reason is that sensor is too old. | Check reference. Gas valve may be shut.<br>Check that probe tip is not clogged.<br>Check setting of Reject Level.<br>Replace sensor if problem remains. |
| High signal! Check reference! | Reference signal is abnormally high. | Check that reference gas mix is not replaced with tracer gas mix.<br>Check condition of reference.<br>Check that reference leak connections has no leaks. |

**Note:** If calibration fails you can still use the instrument. Last valid calibration parameters will be used. You should, however, check that the instrument reacts to the reference.

## Reference Value

Your reference should have a concentration or flow equal to or slightly above what you want to measure. See the examples below for specific recommendations.

### Example for reference gas:

- Reject level is set at 100 PPM
- For good accuracy, use a reference gas between 500-5000 ppm hydrogen.

## Reference Unit

The Reference Unit is set in the *Calibration* menu. Select PPM, cc/s, cc/min, SCCM, g/a, oz/yr, mbarl/s, mm3/min, Pa m3/s or Custom. When you select Custom you can enter any unit as long as it contains a maximun of 12 characters.

Calibration can be performed with:

- a known hydrogen concentration
- a known flow leak

The following characters can be used: Upper and lower case Roman letters, the numbers ü,ü, Å, Ä,Ö, å,ä,ö,%,/,(,),and - (dash).

**Note:** The space (“ “) is not supported. The leak rate unit string will be cut short at the first space found. See “Engineering format” on page 19.

## Calibration Time

The calibration time decides how long time the detector looks for a reference signal before giving up. If the calibration is set to, for example, 6 seconds the detector will record the maximum signal during 6 seconds after that the operator (or external hardware) orders a calibration.

It is very important that all delays in gas exposure as well as reaction time of sensor are taken into consideration when setting the calibration time. Calibration will not be correct if the maximum signal comes after that the calibration time has terminated.

This is also the timeout of the Calibration line in an APC program.

### Minimum calibration time

This parameter sets the lowest possible *Calibration Time* that can be set under the *Calibration* menu. Default is 5 seconds.

Minimum calibration time should be set to safeguard so that the following two requirements are fulfilled:

1 The hydrogen from the reference leak or gas line must reach the sensor before end of calibration time.
2 The sensor must have time to reach its maximum signal before end of calibration time.

Setting *Min Calibration Time* too low will have the following effects:

- Calibration will fail if calibration time is set too low.
- Calibration might pass but be incorrect.

Setting a high *Min Calibration Time* will have the following effects:

- Calibration takes longer time than necessary.
- Calibration gas consumption is higher than necessary.

**NOTICE!** Correct calibration is an essential parameter in quality testing. We, therefore, recommend that careful consideration is paid to setting an appropriate *Min Calibration Time*. This will inhibit personnel, lacking detailed knowledge about calibration, from jeopardising quality by setting a too short *Calibration Time*.

### Password protected calibration

If desired, the calibration can be set under the general password to prevent the operator from calibrating by mistake. In this case you will have to enter the password to start the calibration routine. Setting password protection on calibration is done in the General Settings menu. Note that you must also set a password. The instrument is delivered with no password set.

## 8.5 Detection Mode Settings

In *Detection Mode*, the signal is displayed in the form of a bar. The length of the bar varies with the gas concentration.

### To detect leaks

If all you wish to do is to detect the presence of a leak, that is, to find out whether there is a leak or not, then use the Detection Mode. The definition of Leak/No Leak will be ”A leak is a leak when it can be detected by the detector, set to a specific sensitivity”.

**To set up:**

The operation in Detection Mode is not quantitative. No figures are given but the signal is still increasing and decreasing with gas concentration. Therefore, there is no actual calibration to be done, but rather a setting of the sensitivity to a desired level.

A typical set-up procedure for the Detection Mode is:

- Set up a reference leak which corresponds to the smallest leak you wish to detect.
- Put the probe close to the reference leak and note approximately what reaction you get (no reaction, small, medium, high, full scale) within the first few seconds.
- Set the sensitivity. This can be done permanently under the menu *Detection Mode* or temporarily as a Direct Sensitivity Setting on the display (unless you have set this function to OFF under menu Sensitivity Settings. There is also an Auto ranging function which can be selected under the *Detection Mode* Settings menu.)

If the sensitivity is set very high, you may find the baseline annoyingly unsteady.

**Note:** If the Detection Mode is used and the alarm function is required to be activated at a particular calibrated level, then the unit must be calibrated. The reason for this is that the alarm is immediately based on the Analysis Mode when the Detection Mode is displayed, due to inaccuracies in the Detection Mode signal.

## To locate leaks

Detection mode is semi-quantitative, that is, it gives an audio and visual signal which increases as a leak is approached (a higher gas concentration) and decreases as you move the probe away from the leak. It does not display figures.

In this mode of operation leaks can easily be detected using a sensitivity which can be preset. Leaks can be located very accurately, even when there are other leaks nearby.

If, for example, you are trying to locate a leak on a refrigerator condenser tubing and the tubing has a major leak, then you will get an audio signal as soon as the probe is placed close to the condenser tubing. When the probe is moved around over the condenser, the signal will increase as the probe approaches the leak. If the signal goes off the scale, simply reduce the sensitivity setting to bring the signal within the scale. By working with the sensitivity setting in this way, you will be able to locate multiple leaks that are in close proximity to each other.

Do not expose the probe to more gas than is necessary, because it will slowly saturate with time. It is good practice to detect a leak, locate it, and immediately remove the probe to avoid saturation. The probe is not damaged by the exposure but it will recover more slowly. After excessive exposure it will be less sensitive for a short period of time.

## Background compensation

There is always some hydrogen gas in the background. In fresh air this is as low as 0.5 ppm (parts per million).

Sensistor ISH2000 HySpeed actively adjusts itself to the background.

## Sensitivity

*Sensitivity* of audio signal and signal bar in *Detection Mode*.

**Note:** This does not affect the *Analysis Mode*.

### Auto Range

Set this parameter to ON for auto ranging of sensitivity in *Detection Mode*. Sensitivity will decrease two steps if the signal reaches full scale. Sensitivity is restored to selected *Sensitivity* (See "To locate leaks" on page 24) when signal returns to zero.

### Direct Sensitivity Adjustment

Setting this parameter to OFF will remove the sensitivity adjustment from the *Detection Mode* display. Sensitivity can still be adjusted in the *Sensitivity Settings* menu after entering password (if set).

**Note:** The sensitivity setting only affects the *Detection Mode*.

### Audio Threshold

Makes it possible to lower the sound to a set level in Detection Mode. The level is in % of full Detection bar.

### Reject Indicator

Makes it possible to show (not shown) the indication Reject in Detection Mode.

### Audio Ready Pulse

This sets the standby sound to a silent or or pulsating tone.

## 8.6 Analysis mode

In *Analysis Mode* the measured value is displayed in figures. The default unit is in PPM but it is possible to choose other units, See "Default parameters" on page 40.

### To analyse leaks

The Analysis mode is used for measuring the size of a leak (or the concentration of a gas sample). To be able to do this measurement and obtain correct values, the instrument must first be calibrated using the calibration function.

In the Analysis mode the detector determines the gas concentration from the change, as the probe goes from being exposed to background to being exposed to a certain gas concentration. The detector does not continuously monitor the gas concentration but takes just one reading instead. Another suitable alternative name for this mode could be Sampling Mode. It is important to keep this in mind when using the detector in this mode.

In Analysis mode the probe should be moved directly from a background situation to the test point. The size of the leak in PPM, or any other selected units, is shown on the display. The probe can and should be removed from the measuring point as the measured value remains on the display.

The period during which the measured value is displayed can be adjusted in the Display Settings menu.

### Reject level

Threshold level for Reject decisions. When this level has passed Reject it will be indicated by audio and LED signals Reject on APC-bus high.

**Note:** The frequency of the acoustic signal in *Analysis Mode* is controlled by *Reject Level*. A signal equal to the *Reject Level* will always give the same audio frequency despite the actual signal strength.

### Correlation Value

*Correlation Value* is used when it is necessary to correct the relation between the detector signal and the displayed number. This might be necessary when you want to display leak rate unit other than the calibrate leak rate unit. Examples: If you have a reference value in cc/s and want to show mm3/s at the screen, use 1000 as Correlation Value.

### Analysis Unit

The *Analysis Unit* is a text string with a maximum of 12 characters. It is not involved in any calculations.

The following letters can be used; Upper and lower case English letters, the numbers 0 to 9, Å, Ä, Ö, å, ä, ö, %, /, and -. Space (" ") is not supported. The string will be shortened after the first space found.

### Min Presentation Time

Signal values in *Analysis Mode* will never be presented shorter than this time. Values are, however, always presented until the signal has recovered. The default value is 1 second, but values from 0.1-12.0 seconds can be used.

### Display Threshold

Hides all measurements under a set % of Reject Level.

### Audio Threshold

Instrument is silent under a set % of Reject Level.

### Reject Indications

There are three choices of Reject Level indications except the LEDs indication:

- Flashing screen
- Chopped audio signal
- Combination of indication 1 and 2.

### Show Reject Level

Shows the Reject Level value on the display.

### Audio Ready Pulse

This sets the standby sound to a silent or or pulsating tone.

## 8.7 APC Settings

APC is an abbreviation for Active Probe Control. The APC function is for the control of an active probe that has a built-in alarm, valves or pumps via Probe Control Port.

Different probes require controls therefore, it is possible to download different drive routines for the instrument from a PC.

There is a possibility to adapt how to measure by adjusting the timers and Purge Level.

### Probe Type

Select the connected probe. Choose between "*Hand Probe*" and another probe driver installed from the disc delivered with active probe (if ordered).

### APC Time A-D

Adjustable timer used by the APC system. Select a APC timer and press "Enter" to display specific use of this timer. APC timer can be used for general purposes in a custom APC program.

### Purge Level

Signal level controlling the Purge_Level APC Triggers. Standard probes that support active sampling use the *Purge Level* for fast interruption of sampling that result in high gas signals.

Setting *Purge Level* equal to, or just above, *Reject Level* will give the fastest possible cycle times for those probes.

Quick purging also enhances signal repeatability.

**Note:** Purge level interrupts active sampling of APC probes. This means that higher signals will be underestimated as the sensor is purged before full signal has developed.

## 8.8 Display Settings

This section describes the different display settings of the Sensistor ISH2000 HySpeed.

### Contrast

Contrast level of display. Higher value gives higher contrast. The contrast may need adjustment if ambient temperature changes.

### Brightness

Brightness of the display lamp. A lower brightness value saves energy and prolonges the lamp.

### Invert Colors

Change the black to white and white to black. Useful in a dark environment to keep a high readability.

### Screen Save Timeout

Display lamp will dim to half brightness if instrument is left idle for the number of minutes set by this parameter. The screen save timeout can be set between 1 and 60 minutes, the function is deactivated if set to OFF. The display lamp will return to the

set brightness if any of the display buttons are pressed, if a gas signal is detected or an instrument error is detected.

## 8.9 General settings

This part describes the general settings of the Sensistor ISH2000 HySpeed.

### Language

The Sensistor ISH2000 HySpeed user interface contains the following languages:

- English
- French
- German
- Italian
- Spanish
- Swedish

### Probe Button

This is for setting the different functions with the probe button. These functions are as follows:

- Toggle Mode-makes it possible to switch between Analysis mode and Detection mode.
- Zero detection signal-in Analysis mode and Detection mode.
- Measure/Print-makes it possible to initiate sample cycles or send the values from the hand probe measurement to the printer port.
- Probe Lamp-makes it possible to turn on and off the Probe Lamp.

### Probe Lamp

Makes it possible to have the Probe Lamp on even if the other Probe Button function is chosen.

### Change Password

The user password is a text string (max 12 alphanumerical characters) used to lock critical parameters. Setting password to an empty string (no characters) means that no password is needed to modify the critical parameters. The default is no password (“”).

Contact INFICON AB if you have lost your user password. If the *Password Protected Calibration* parameter is set to ON you will be prompted for a password when starting a calibration.

**Note:** Setting *Password Protected Calibration* to ON has no effect if no password is set.

**Note:** APC controlled calibration can be started from the bus in both cases.

### Audio Base Frequency

This sets the lowest audio base frequency tone in Analysis and Detection Mode.

### Set Clock

Real time set as hh:mm:ss. Hours and minutes can be adjusted. Seconds will automatically be set to 00 when hours and minutes have been set. Clock runs even when detector is disconnected from the power supply.

### Set Date

Real Time Clock date set as YY-MM-DD. Clock runs even when detector is disconnected from the power supply.

### Printer Port

The Sensistor ISH2000 HySpeed is equipped with a serial (RS232) printer port. See “Printer port” on page 33.

### Info

Contains information about software versions, Serial number, and Internet contact information.

## 8.10 Service Settings

The Service Mode is reached by starting the instrument and at the same time hold the right button down on the panel. After start a new main menu called Service Settings will appear.

### Show Password

Shows the chosen password in case the customer has forgotten the password. Contact INFICON AB to have the code sent to you. See the web address under the section-Info.

### Instrument system Reset

Resets all parameters into the instrument to default settings. Contact INFICON AB to have the code sent to you. See the web address under the section-Info.

### Probe System Reset

Resets all parameters into the probe to default settings. Contact INFICON AB to have the code sent to you. See the web address under the section-Info.

### Detector Signal Level

The *Detector Signal Level* is the level which the sensor is considered to have recovered from the last gas signal. It decides when the DET_SIGNAL output will come on. this signal can be used to block the start of a calibration or new test cycle in semi and fully automatic testers.

IF DET_SIGNAL is high then this means that the sensor has detected hydrogen and has not yet recovered.

*Detector Signal Level* can be adjusted in the *Service Settings menu*. You can increase *Detector Signal Level* if you have many small disturbing signals. A high setting of *Detector Signal Level* gives better tolerance to “noise” gas signals at the expense of accuracy. A low setting gives best accuracy but lower tolerance for “noise” gas signals. The *Detector Signal Level* is set as 1 to 100% of the *Reject Level*. Default is 20%.

**NOTICE!** Increasing the *Detector Signal Level* may give poorer accuracy.

### HySpeed Parameters

Adjustible HySpeed algoritm parameters. Useful for tuning the gas metering situation.

### Minimum Calibration Time

Lower limit setting for the timer which is used during calibration. Contact INFICON AB to have the code sent to you. See the web address under section-Info.

### Calibration Tolerance

Change the acceptance tolerance limit at calibration. Adjustable between 0-100%.

### Number of Significant Digits

Choice of a number of significant numbers in Analysis and Combined Mode. It is used when a more exact measurement is needed. A good control of the environment and calibration is required to be useful. Contact INFICON AB to have the code sent to you. See the web address under section-Info.

### Debug Mode

This mode is used during service and software development.

### Service Mode

This mode contains useful information to analyse the gas sensor behavior. If the instrument starts in the Service Mode then it is possible to reach APC Service Mode. Under APC Service Mode is useful information to check timers, I/O on the Probe Control Port, and other.

## 8.11 Combined Mode

In *Combined Mode* the bar and the sound in *Detection Mode* is combined with the figures in *Analysis Mode*, this means that at the same the signal is displayed as a bar and the measured value is displayed in figures.

The loud speaker sound follows the Detection Mode signal.

**Note:** After a system reset the default mode is *Combined Mode*.

When you have located the leak then you can measure its size in the following way:

1. Remove the probe from the leak.
2. Wait until 0.0 appears on the display
3. Then put the tip of the probe on the leak.

## 8.12 Probe

The probe H65 is a non-sniffing probe. Gas analysis takes place in a sensor that is in the tip of the probe.

During operation the heat of the probe tip is 50°C

**Note:** There are a variety of different probes that can be connected to the Sensistor ISH2000 HySpeed.

### Changing the Probe

After attaching a probe the Sensistor ISH2000 HySpeed needs to stabilize, and the green LED should blink. If it does not, then there is a fault in the cable or the hydrogen sensor inside the probe is faulty.

When the stabilisation period is over the green LED should stay on. Before using the Sensistor ISH2000 HySpeed the instrument needs to be calibrated. Repeat calibration after one hour to achieve greatest accuracy.

## 8.13 Probe Control Port

The Sensistor ISH2000 HySpeed is equipped with a parallel Probe Control port. This Probe control port can be used for controlling active probes, feeding status signals to a supervising computer system, and for simple test fixture control.

**CAUTION!**

The Probe Control Port (25-pin D-type) on the back of the instrument is not a computer or printer port. Connecting a printer or any other computer device may cause permanent damage to the connected device.

Pin configuration for the different detector models is described under Model Specific Specifications below.

See “Sensistor ISH2000 HySpeed specifications” on page 43 for electrical specifications.

See “Status signal patterns” on page 32 for signal patterns.

### Probe Control Port Connector

The control port connector is a 25-pin female D-sub. Refer to Table 8-2 for the pin configuration.

Table 8-2. Pin configuration.

| Pin | Type | Signal name |
|---|---|---|
| 1 | - | GND |
| 2 | - | GND |
| 3 | - | GND |
| 4 | IN | IN_0 |
| 5 | IN | IN_1 |
| 6 | IN | IN_2 |
| 7 | IN | IN_3 |
| 8 | IN | IN_4 |
| 9 | OUT | CAL_CONF |
| 10 | OUT | OUT_6 |
| 11 | - | GND |
| 12 | - | GND |
| 13 | - | GND |

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| Pin | Type | Signal name |
|---|---|---|
| 14 | OUT | DET_ERROR |
| 15 | OUT | LEAK_OUT |
| 16 | OUT | DET_ON |
| 17 | OUT | DET_SIGNAL |
| 18 | OUT | DET_WAIT |
| 19 | OUT | OUT_0 |
| 20 | OUT | OUT_1 |
| 21 | OUT | OUT_2 |
| 22 | OUT | OUT_3 |
| 23 | OUT | OUT_4 |
| 24 | OUT | OUT_5 |
| 25 | OUT | 24 VDC OUT |

## Status signal patterns

Table 8-3. Status signals for pin 14 - 18 (see “Pin configuration.” on page 31).

| Signal | Function |
|---|---|
| DET_SIGNAL | Gas detected / Sensor not recovered. |
| DET_WAIT | High during warm-up. |
| DET_ON | High when detector is on. |
| LEAK_ALARM | Leak above Reject Level detected. |
| DET_ERROR | High if Probe, Sensor or Cable is broken. |

DET_ERROR will go high for a short time (1-5 seconds) when the detector is switched on. It will go low when the sensor has been checked.

In normal operation, DET_ERROR = HIGH means that there is a problem with the sensor, probe, or cable.

DET_WAIT is high when instrument is in warm-up mode after switching on power. Instrument will also go into warm-up if there is a temporary fault in the sensor or sensor connection.

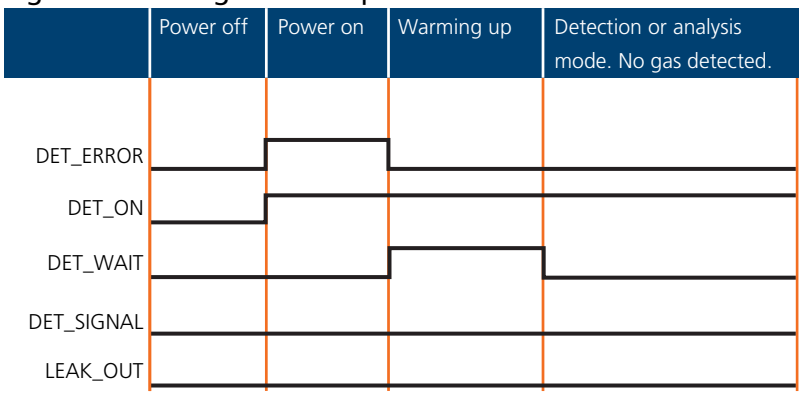
The timing of the status signals in relation to different events is described by the following two examples:

**Example:** Input signals issued to control the APC system should have a pulse length of at least 40 ms.

**Example:** Output signals switch with a cycle time of 10 ms (0.01 s). This is the cycle time of the APC system.

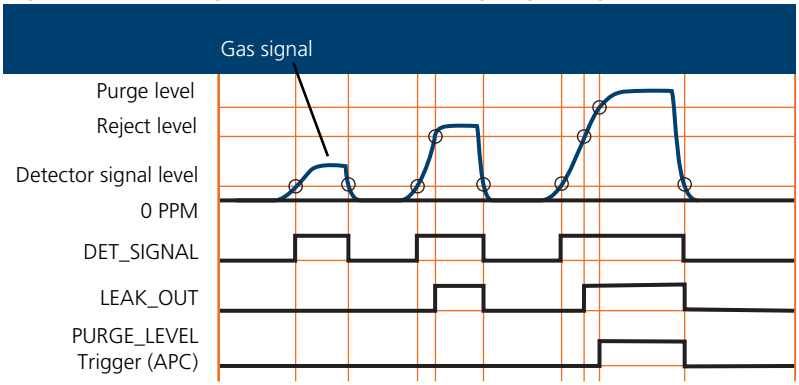
### After power on

Fig 8-3. Status signals after power on.




### When detecting a gas signal

Fig 8-4. Status signals when detecting a gas signal.




## 8.14 Printer port

The Sensistor ISH2000 HySpeed is equipped with a serial printer port. This is the 9-pin D-type connector. It is used for printer connection, RS232 commands and APC driver installation.

**NOTICE!**

Always switch power off before disconnecting or connecting any cable.

### Connector pin configuration

The printer port is a standard 9-pin male D-sub. The connecting cable is a standard 9-pin file transfer cable (Null Modem Cable). For the pin configuration refer to Table 8-4.

Table 8-4. Pin configuration of the printer port.

| Pin | Signal | Comments |
|---|---|---|
| 1 | (DCD) | Not used |
| 2 | RD | Received data |
| 3 | TD | Transmitted data |
| 4 | (DTR) | Not used |
| 5 | SG | Signal ground |

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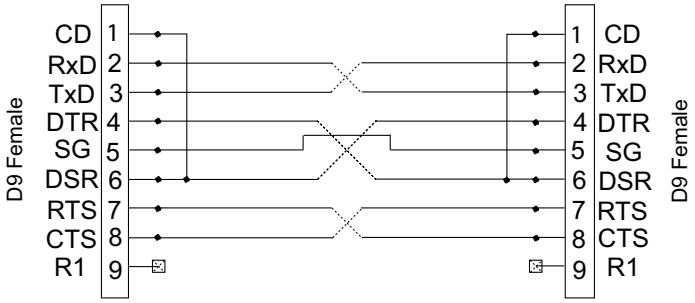
| Pin | Signal | Comments |
|---|---|---|
| 6 | (DSR) | Not used |
| 7 | (RTS) | Not used |
| 8 | (CTS) | Not used |
| 9 | (CE) | Not used |

Only pin 2 (Received data), pin 3 (Transmitted data) and pin 5 (Signal ground) are used. Refer to Figure 8-5 for the wiring diagram.

Fig 8-5. D9 Null modem cable wiring diagram




## Selectable printer types

Most PC-printers with serial interface can be connected to the 9-pin printer port. Parallel (Centronics) interface printer can be used if connected through a serial to parallel converter.

The port can be set up for the following printer types: PC Printer and Data Dump.

### No printer

Printer output disabled. Incoming communication is enabled. Sensistor ISH2000 HySpeed listens for incoming data but will not print/send test results.

### PC printer (with serial interface)

The *PC Printer* option can be used to print data on most standard PC printer with serial interface. Parallel interface printers can be used if connected through a serial to parallel converter (see below).

**Note:** The output format has been chosen to be as simple as possible to ensure that most printers will accept it. Therefore, the printer output does not use any flow control. This means that some printers may delay printing until the input buffer is full or a pre-defined timeout has elapsed.

Table 8-5. Communication specifications.

| Setting | Value |
|---|---|
| Data rate | 1200 baud |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Flow control | None |

**Note:** Due to the large variety of printers available on the market, INFICON does not take responsibility for the operation of a particular type of printer.

### Printed data

The detector can print the following information:

1 Date and Time for Power on of detector.
2 Time of print.
3 Value of all gas signals above the Reject Level.
4 Test result: “Accept” or “Reject”.
5 Value of signal.
6 Result of calibration: “OK” or “Calibration Not saved”, Date and Time, Parameter settings.

Printing of the current value can also be requested by an RS232 command (See “Connector pin configuration” on page 33) or ordered manually by pressing *PRINT*.

Table 8-6. Probe type determines information printed.

| Probe type | Data printed |
|---|---|
| Hand Probe P50 / COMBOX with H65 | 1, 2, 3, 4, 6 |

### Analysis data output

The *Analysis Data Output* option is intended for transferring test results to a supervising computer system such as, for example, a PLC system.

Table 8-7. Communication specifications.

| Setting | Value |
|---|---|
| Data rate | 9600 baud |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Flow control | None |

The data format for Analysis data output consists of nine ASCII characters. Seven characters show the value in engineering format (See “Engineering format” on page 19), one character shows the result of the test, and one character shows line feed (LF).

Table 8-8. The character indicating the result of the test is one of the following.

| Character | Result of the test |
|---|---|
| A | Accept. Previous test was below Reject Level limit. |
| R | Reject. Previous test was above Reject Level limit. |
| P | Rejected by Purging. Previous test was above purge limit (and Reject level limit). |
| C | Calibration approved. Previous cycle was calibration. Calibration was approved. |
| F | Calibration failed. Previous cycle was calibration. |
| E | Test interrupted by “Error” that occurred during cycle (probe or sensor error etc.). |

**Example:** 2.5E-02R (LF)
This example is a line feed (LF), R means that the test was above the Reject Level limit, and the value was 2.5E-02.

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For passive probes (for example P50 and AP57*) data is printed when a signal is detected above *Reject Level* or when the print button is pressed. Activate this under *Measure Button* menu.

For active probes (e.g AP29eco) data is printed at end of measurement sequence.

Printing of the current value can also be requested by an RS232 command or ordered manually by pressing *PRINT*. See “Connector pin configuration” on page 33.

* A custom APC program setting the MEAS flag prints as AP55/AP29eco and an APC program not using MEAS flag prints as P50.

### Detection data output

The *Detection Data Output* option is intended for automated scanning of weld seams etc.

**Note:** The *Detection Data* is expressed in arbitrary units. *Detection Mode* signal is not affected by calibration!

Table 8-9. Communication specifications.

| Setting | Value |
|---|---|
| Data rate | 9600 baud |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Flow control | None |

The data format for Detection data output contains of ten ASCII characters. Nine characters show the value in engineering format (See “Engineering format” on page 19), and one character shows linefeed (LF).

The print time is 50 Hz continuous streaming data.

**Note:** Data rate is 25 Hz when Sensistor ISH2000 HySpeed is running in *Service Display Mode*.

## RS232 serial communication

The most commonly used Sensistor ISH2000 HySpeed functions can be started/ configured over the RS232 interface.

Table 8-10. RS232 communication specifications.

| Setting | No Printer | PC Printer | Data Output |
|---|---|---|---|
| Data rate | 115200 baud | 1200 baud | 9600 baud |
| Data bits | 8 | 8 | 8 |
| Stop bits | 1 | 1 | 1 |
| Parity | None | None | None |
| Flow control | None | None | None |

### RS232 interface commands

Table 8-11. Common used functions.

| Command | Header |
|---|---|
| Calibrate | K |
| Measure | M |
| Print Request | N |
| Stop Measurement | Q |
| Hand Probe | R |
| Active Probe (Installed AP) | S |
| Analysis Mode | X |
| Detection Mode | Z |
| Combined Mode | Y |

### K = Calibration request

Starts calibration if the Sensistor ISH2000 HySpeed has an active probe driver installed. Sensistor ISH2000 HySpeed answers with a "K" if an active driver containing a calibration routine was found and "F" if the calibration APC sequence not found. Calibration doesn't start if Purge level is reached.

### M = Measure Request

The active test cycle defined by the APC driver starts. "M" is returned if the selected driver supports active test. "F" (failed) is returned otherwise.

### N = Print Request

Returns current analysis value.

### Q = Set APC in stand by, (stop a measurement)

Returns a "Q".

### R = Activates probe 0 (built in P50/Combox with H65 driver)

Returns an "R".

### S = Activates probe 1 (Installed probe driver or trigg signal handler driver)

Returns an "S".

### X = Shift State to "Analysis Mode"

Returns nothing.

### Z = Shift State to "Detection Mode"

Returns nothing.

### Y = Shift State to "Combined Mode"

Return nothing.

### Supported parameters

Table 8-12. The following parameters can be downloaded to Sensistor ISH2000 HySpeed in *Analysis* and *Detection mode*.

| Parameter | Header | Data |
|---|---|---|
| Reject Level | A | n.nnE+nn |
| Correlation Value | B | n.nnE+nn |
| Analysis Unit | C | Text string (max 12 characters) |
| Analysis Unit | CUx | x=1 to 8, 1=PPM, 2=CC/S up to 8 |

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| Parameter | Header | Data |
|---|---|---|
| Timer A | D | nnn* |
| Timer B | E | nnn* |
| Timer C | F | nnn* |
| Timer D | G | nnn* |
| Purge Level | H | n.nnE+nn |
| Reference Value | I | n.nnE+nn |
| Reference Unit | J | Text string (max 12 characters) |
| Reference Unit (Program settings) | JUx | x=1 to 8, 1=PPM, 2=CC/S |

* entered as integer in 100's of seconds, 1= 0.01s, 100 = 1 s, 60000 = 600s.

### Transfer of parameters

Send parameters one by one; first send the specific header (for example "A"), then wait until the RS232 transmitter unit has sent the data (approximately 20 ms), and then send the data (for example "1.00E+01"). Data string must be ended with a carriage return character, chr13 (dec).

**Example:** "CPPM" or "C PPM", Carriage Return (chr 13). This sets Reject Level Rate Unit to "PPM".

Parameters can be sent in any order you like:

- If your data was received and correct, Sensistor ISH2000 HySpeed immediately echoes (sends back) the data.
- If you send a non existing header you will not receive anything.
- If the data could not be converted in the Sensistor ISH2000 HySpeed you will receive the string "CoEr", (Conversion Error).

**Note:** Remember to use capitals for the header.

## APC driver installation

APC drivers are installed in the detector from a PC. All active probes need a driver to be installed before they can be used.

For driver installation you will need the following:

- APC Driver software.
- File transfer cable.
- PC computer with Windows 95 or later.

## 8.15 Sensistor ISH2000 HySpeed installation

The instrument can be installed in the operator's panel or any other flat surface of your leak tester. Mounting brackets and panel rubber seal are delivered with the detector. Refer to Figure 8-6.

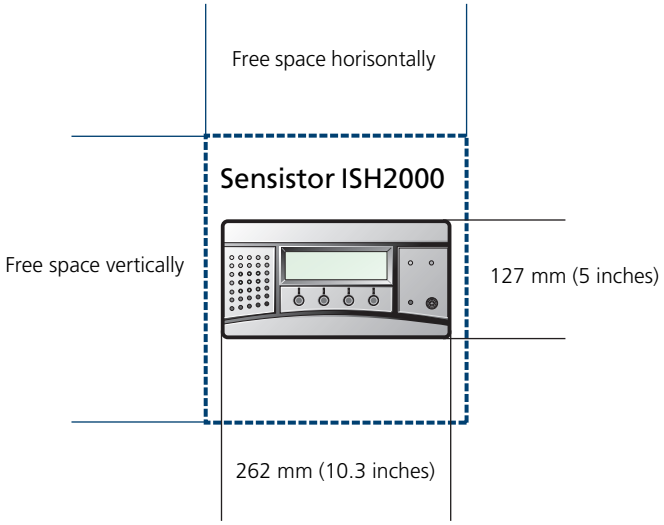
**CAUTION!**

**The detector should preferably be mounted on a vertical surface. Tilting more than 30 degrees is not recommended. Tilting more makes air circulation poor resulting in increased temperature inside detector. This will reduce contrast of display and lifetime of lamp and electronic circuits.**

**NOTICE!**

After installation verify that ambient temperature is below 50°C.

Fig 8-6. Panel cut out dimensions.




Measurements:

- Panel cut out: 262 x 127 mm (5 x 10.3 inches).
- Maximum panel thickness: 8 mm (0.3 inch).
- Allow an extra 20 mm (0.8 inch) on left and right side for mounting brackets.
- Depth of open space in panel is at least 15 cm (6 inches) for Sensistor ISH2000 HySpeed to fit.

### Installation process

Table 8-13. Install the detector as follows

| Step | Action |
|---|---|
| 1. | Cut hole in panel according to figure above, and remove burrs. |
| 2. | Check that rubber o-ring is in correct position in the grove around the edge of the detector. |
| 3. | Put the detector in place in the panel hole. |

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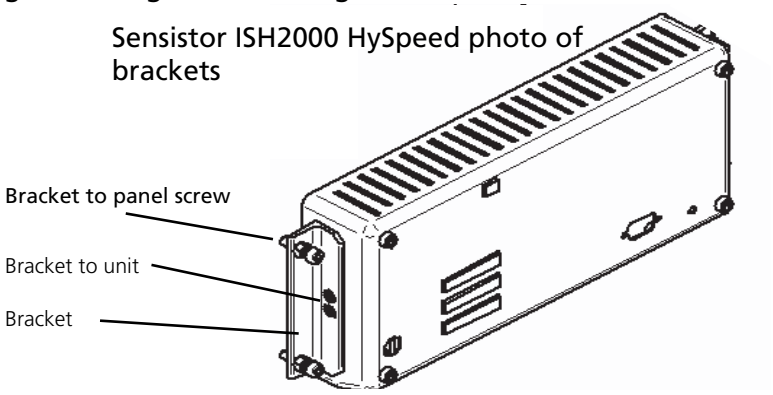
| Step | Action |
|---|---|
| 4. | Hold the panel in place while fixing the mounting brackets to the detector (See Figure 8-7). |
| 5. | Align the detector horizontally and lock it by tightening the 4 set screws. |
| 6. | Lock the set screws with the locking nuts. |
| 7. | Connect ground terminal to protective ground of cabinet. |

Fig 8-7. Fixing the mounting brackets.




See “Sensistor ISH2000 HySpeed specifications” on page 43 for electrical connections.

## 8.16 Default parameters

Table 8-14. Range and default settings of all Sensistor ISH2000 HySpeed parameters.

| Parameter | Range | Default |
|---|---|---|
| Analysis Unit | Several Choices | PPM |
| APC Time A | 0.0 - 6000.0 s | 1.0 s |
| APC Time B | 0.0 - 6000.0 s | 0 s |
| APC Time C | 0.0 - 6000.0 s | 0 s |
| APC Time D | 0.0 - 6000.0 s | 0 s |
| Audio Base Frequency | Several Choices | 400 HZ |
| Auto Range | ON/OFF | ON |
| Audio Ready Pulse | ON/OFF | ON |
| Audio Threshold (Detection) | 0 - 100% | 0% |
| Audio Threshold (Analysis) | 0 - 100% | 4% |
| Brightness | 0 - 21 | 21 |
| Calibration Time | Min Calibra. Time-30 s | 10 s |
| Calibration Tolerance | 0-100% | 25% |

| Parameter | Range | Default |
|---|---|---|
| Clock | hh:mm:ss | - |
| Contrast | 0-20 | 10 |
| Correlation Values | 1.00E-37 - 1.00E+37 | 1.00E+00 = 1 |
| Date | YY-MM-DD | - |
| Debug Mode | ON/OFF | OFF |
| Detector Signal Level | 0 - 100 % | 20 % |
| Direct sensitivity adjustment | ON/OFF | ON |
| Display Threshold | 0 - 100% | 50% |
| Invert Colors | ON/OFF | OFF |
| Language | Several choices | English |
| Measure/Print Button | ON/OFF | OFF |
| Min Calibration Time | 0 - 30 s | 5 s |
| Min Presentation Time | 120 s | 1 s |
| Number of significant Digits | 2/3 | 2 |
| Password | Max 12 characters | “” = No password |
| Password protected calibration | ON/OFF | OFF |
| Printer Port | Several choices | No Printer |
| Probe Button | Several Choices | No Function |
| Probe Lamp | ON/OFF | OFF |
| Probe Type | Several Choices | Hand Probe |
| Reject Indicator | ON/OFF | ON |
| Purge Level | 1.00E37 - 1.00E+37 | 1.00E+05 = 100000 |
| Reference Unit | Several choices | PPM |
| Reference Value | 1.00E- 37 - 1.00E+37 | 1.00E+0,2 = 100 |
| Reject Indication | ON/OFF | OFF OFF |
| Reject Level | 1.00E-37 - 1.00E37 | 1.00E+02 = 100 |
| Screen Save Timeout | 1 - 60 min | 20 min |
| Sensitivity | 1 - 15 | 8 |
| Show Reject Level | ON/OFF | ON |
| Menu Mode | Several choices | Combined Mode |

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# 9 Trouble-shooting

In case of trouble using the Sensistor ISH2000 HySpeed, try to solve the problem with these simple trouble-shooting guidelines. If the measures described below do not result in a functioning instrument, send or hand in the instrument to an authorised service workshop for repair. See “Support by INFICON” on page 48.

**WARNING!**

**Opening or dismantling a Sensistor ISH2000 HySpeed that is powered up can cause serious personal injury or danger to life. The instrument contains no parts that can be repaired by the user and may only be dismantled by an authorised service technician.**

Table 9-1. Fault symptoms and measures.

| Fault symptoms | Measures |
|---|---|
| No sound in Detection Mode and Analysis Mode. | Press the + button repeatedly. |
| No picture on display, no sound. | Check the fuse. |
| No picture but only sound when exposed to gas. | Display setting may be wrong. Watch the display from the side at a low angle and aim a lamp at the screen. Try to see the text so that you can enter the Display Settings menu and adjust contrast and brightness. If this doesn’t help - send in the instrument for replacement of display lamp. |

Table 9-2. Error messages and measures.

| Error messages | Measures |
|---|---|
| Check Probe and Cable. Red LED flashes quickly. | Check that the probe cable is properly connected to the probe and the instrument. If the fault persists, replace the probe/cable. |
| Error | Error in Active Probe. See Probe Manual. |
| Check Sensor, Voltage Error | Check that the sensor is properly connected to the probe. If the fault persists, replace the sensor. |
| Check Sensor, Temp. | Check that the sensor is properly connected to the probe. If the fault persists, replace the sensor. |

# 10 Sensistor ISH2000 HySpeed specifications



Table 10-1. Power supply specifications.

| Power | Sensistor ISH2000 HySpeed |
|---|---|
| AC mains voltage | - |
| AC mains current | - |
| Fuse | - |
| Nominal battery voltage | - |
| Operating time | - |
| Charging time | - |
| Power supply voltage | 24 VDC |
| Power supply current | 3 A max. |

Table 10-2. Input and output connections.

| Input/output | Sensistor ISH2000 HySpeed |
|---|---|
| Power input connector | 4 pin Phoenix MC 1.5/5.81 Series Detachable screw terminal. |
| Probe control/Status port | 25-pin D-sub female. |
| Minimum pulse length | 40 ms |
| Input impedance | 50 kohm |
| Input maximum range | -34 to +38 VDC |
| Input high | > 12.0 VDC |
| Input low | < 8.0 VDC |
| Output current | max 0.5 A/output, max 2.5 A total |
| Inductive loads | External clamp diodes recommended |
| Low state voltage | Max 1.5 VDC |
| Low state leakage current | Max 100 µA |
| Short circuit protection | Thermal and electronic |
| Output high | > (Supply voltage - 2.5 VDC) |
| Output low | < 1.5 VDC |
| Serial communication port connector | 9-pol D-sub male |
| Serial communication port standard | RS232 |

Table 10-3. Miscellaneous specifications.

| Misc. | Sensistor ISH2000 HySpeed |
|---|---|
| Protection (IEC529) | IP64 (front), IP32 (back) |
| Net weight | 1.8 kg (4.0 lb) |

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| Misc. | Sensistor ISH2000 HySpeed |
|---|---|
| Overall dimensions | 275 x 140 x 75 mm (11 x 6 x 3 inches) |
| Environment temperature | 0-50°C |
| Environment humidity | 10-90% RH |

Table 10-4. Gas sensing specification (In Detection Mode)

| Selected unit | Sensitivity |
|---|---|
| **mbarl/s** air (using 5% $H_2$/95% $N_2$ as Tracer Gas) | 1 x $10^{-7}$ mbarl/s |

Table 10-5. Gas sensing specification (In Analysis Mode)

| Selected unit | Sensitivity | Measurement range |
|---|---|---|
| **ppm** ($H_{2)}$ | 20 ppm | 20-50000 ppm |

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# 11 Spare parts and accessories

There are a variety of spare parts and accessories to the Sensistor ISH2000 HySpeed. In the following table some of these are presented, for a complete list of all spare parts and accessories please visit www.inficon.com.

Table 11-1. Spare parts and accessories.

| Part | Part no. |
|---|---|
| Combox (Box for controlling the gas sensor and signal processing) | 590-820 |
| Built-in Probe H65 (Connects to the instrument via Combox) | 590-250 |
| Hand Probe PK50 (Connects to the instrument via Combox)<br>Hand Probe PK50-Flex (Connects to the instrument via Combox)<br>Hand Probe P50 (Connects direct to the instrument)<br>Hand Probe P50-Flex (Connects direct to the instrument)<br>Robot Probe R50 (Connects to the instrument via Combox) | 590-930<br>590-940<br>590-780<br>590-790<br>590-820 |
| Probe Cable C21<br>Length 3m<br>Length 6m<br>Length 9m<br>Length 4m (Spiral)<br>Length 6m (Spiral) | <br>590-161<br>590-175<br>590-165<br>590-163<br>590-164 |
| Probe Tip Protection Cap for Hand Probes P50/PK50 and P50/PK50-FLEX<br><br><br><br>Probe Tip Filter for Hand Probes (P50/PK50) and R50 | 590-625<br>(Set of 500)<br>591-234<br>(Set of 50)<br><br>591-234 |
| Power cable eu<br>Power cable uk<br>Power cable us | 591-146<br>591-147<br>591-853 |
| Hand Probe sensor (fit K50/PK50/R50) | 590-292 |
| Mounting kit Sensistor ISH2000 HySpeed | 590-810 |
| Phoenix connector to Sensistor ISH2000 HySpeed | 591-792 |
| O-ring seal | 591-528 |
| Reference Leaks. Standard or customer specific leaks for detector calibration | see separate Data Sheet |

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# 12 Support by INFICON

## 12.1 How To Contact INFICON

For Sales and Customer Service contact nearest INFICON Service Center. The address is found on the website: www.inficon.com

If you are experiencing a problem with your instrument, please have the following information readily available:

- The serial number and firmware version for your instrument,
- A description of your problem,
- An explanation of any corrective action that you may have already attempted, and the exact wording of any error messages that you may have received.

## 12.2 Returning your instrument to INFICON

Please use the Product Return Form which was included with the product at delivery.

Do not return any component of your instrument to INFICON without first speaking with a Customer Support Representative. You must obtain a Return Material Authorization (RMA) number from the Customer Support Representative.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you may be required to complete a Declaration Of Contamination (DOC) form if your instrument has been exposed to process materials. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory.

# 13 Declaration of conformity



INFICON

## Declaration of Conformity

**Manufacturer**

INFICON AB
Westmansgatan 49
SE-582 16 Linköping
Sweden

Phone: +46 (0)13-355900
Fax: +46 (0)13-355901

**Product**
Hydrogen Leak Detector

**Brand Names**

| | |
|---|---|
| ISH 2000 | (Table top model) |
| ISH 2000 C | (Battery operated model) |
| ISH 2000 P | (Panel mounted model) |
| ISH 2000 ICE | (Table top model) |
| ISH 2000 C ICE | (Battery operated model) |

**The manufacturer declares the above products to be produced in conformity with the following directives**

CE Marking Directive (93/68/EEC)
EMC Electromagnetic Compatibility (2004/108/EC).
LVD Electrical safety - Low Voltage (2006/95/EC)*.
WEEE Waste electrical and electronic equipment (2002/96/EC).
RoHS Restriction of the use of certain hazardous substances in electrical and electronic equipment (202/95/EC)

* Relevant only for battery charger (CE marked) on the Battery operated model.
Manufacturers declaration provided on request.

For INFICON AB, September 01, 2011

Fredrik Enquist / R&D Manager

**INFICON AB**

Box 76, SE-581 02 Linköping, Sweden
Phone: +46 (0) 13 35 59 00 Fax: +46 (0) 13 35 59 01
www.inficon.com E-mail: reach.sweden@inficon.com

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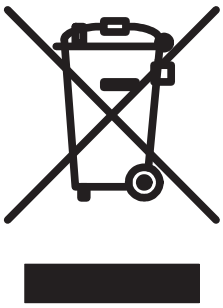

## Disposal of product when taken out of service

According to EU legislation, this product must be recovered for separation of materials and may not be disposed of as unsorted municipal waste.

If you wish you can return this INFICON AB product to the manufacturer for recovery.

The manufacturer has the right to refuse taking back products that are inadequately packaged and thereby presents safety and/or health risks to the staff.

The manufacturer will not reimburse you for the shipping cost.

Shipping address:
INFICON AB
Westmansgatan 49
582 16 LINKÖPING´
SWEDEN

INFICON AB, Box 76, SE-581 02 Linköping, Sweden
Phone: +46 (0) 13 35 59 00  Fax: +46 (0) 13 35 59 01
www.inficon.com  E-mail: reach.sweden@inficon.com